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* C I N O O 9 1 5 *

Trade Unions, Investment and Employment in a Small Open Economy: A Dutch Perspective

by
C.B. Mulder
and
F. van der Ploeg

Reprinted from J. Muysken and
C. de Neubourg (eds),
Unemployment in Europe, London, 1989



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8 Trade Unions, Investment and Employment in a Small Open Economy: A Dutch Perspective*

C. B. Mulder and F. van der Ploeg

ABSTRACT

A model of a small open economy with a well-developed supply-side and demand-side is presented. There are many firms engaged in monopolistic competition, who take the wage and aggregate demand as given, when deciding on their labour demand and investment decisions. Aggregate supply depends on capital, the producers' real wage and aggregate demand; investment depends on what firms expect the real wage, aggregate demand, real interest rates and investment subsidies to be in current and future periods. Aggregate demand depends on disposable income, wealth, public spending, foreign income, the real exchange rate and the world real-interest rate. There is one monopoly union, who chooses the consumers real wage to maximise a utilitarian utility function subject to the constraints describing the rest of the economy. Its behaviour is time inconsistent, since it has an incentive to announce a low wage and then, once capital has been accumulated, renege and cream off the quasi-rent of a more-or-less fixed factor by demanding a higher wage. The time-consistent behaviour is credible but is inefficient due to much lower levels of capital, employment and activity. The results of this analysis are used to describe the Dutch rise in unemployment. This analysis pays particular attention to the level of real benefits, to the wedge between producer and consumer wages, consisting of employers' and employees' social security contributions, direct and indirect taxes and the real exchange rate, to world trade, to investment subsidies and to

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demand management. Sociological changes, to explain a move from 'rules' to 'discretion', may also be important.

1 INTRODUCTION

As in most European countries, unemployment in Holland has increased considerably in the past ten to fifteen years. This phenomenon is of major concern and warrants explanation. This chapter sets out to explain employment and unemployment in a small open economy with powerful trade unions. It provides a framework in which various essential features of a small open economy, like that of Holland, are imbedded. World trade is a dominating factor on the demand side, whereas unions and long-run labour-supply are dominating factors on the supply side. The various instruments which the government has available (tax rates, levels of benefits, investment subsidies, public-sector expenditure and employment) affect both sides of the economy. The investment behaviour of firms is an important link between present and future.

The formal framework developed in this chapter consists of a model with a well-developed supply side and a demand side. The supply side is built around firms engaged in monopolistic competition. This provides a role for demand. The firms take the wage rates and aggregate demand as given when deciding on their labour demand and investment decisions. Aggregate supply depends on capital, the producer's real wage and aggregate demand; investment depends on what firms expect the real wage, aggregate demand and investment subsidies to be in current and future periods. Aggregate demand in turn depends, in a conventional way, on disposable income, wealth, public spending, foreign income, the real exchange rate and world interest rates. In combination with a money-demand equation and the various budget definitions this system can be solved for the real exchange rate, the producers' real wage, output and labour demand in terms of the exogenous variables (the various tax and social security contribution rates, investment subsidies, benefit levels, public-sector expenditure and employment, the real world-interest-rate, foreign income and labour supply) and in terms of the endogenous variables described by the state equations (the capital stock, wealth, and the marginal value of capital). The monopoly union, the Stackelberg leader in the underlying game chooses the consumers' real wage to maximise an

expected utility function subject to the constraints describing the rest of the economy. In other words the interaction of the demand and supply side of the economy leads to a complicated intertemporal labour-demand schedule. This labour-demand schedule depends on the level of the consumers' real wage rate which the firms expect the union to set. From the point of view of the union this labour-demand schedule is the trade-off which it faces between employment and wages. The union will set current and future wage rates to maximise the expected utility of her reference group; subject to the labour-demand schedule. The more emphasis the union puts on employment, the lower will be the wage-rate it chooses and vice versa: the smaller the emphasis on employment the higher the wage rates.

In the absence of binding contracts the union's behaviour is time inconsistent (Kydland and Prescott, 1977) since it has an incentive to announce a low wage and then, once capital has been accumulated renege and cream off the quasi-rent of a more or less fixed factor by demanding a higher wage. The time consistent outcome is credible, but is inefficient due to much lower levels of capital, employment and activity. This is the paradox of the disadvantageous power of the monopoly union.

The results of this paper are used to analyse the major empirical tendencies of the past decades in Holland, in a coherent way; the rise in unemployment and the large drop in investment, the increase in the wedge between real producers' and real consumers' wages (consisting of the employers' and employees' social security contributions, the wage tax, indirect taxes and the real exchange rate), the large changes in world trade growth and real world interest rates, the continuous rise in public sector employment and real benefits. Attention is paid as well to sociological changes which might explain a move from the time inconsistent to the time consistent outcome.

The analysis put forward in this paper assumes a rational trade union, which uses its power to achieve its goals. Unemployment is henceforward the consequence of a rational choice by the union, a choice between wages and (un)employment. What does this approach imply for the causes of unemployment? First, it should be remarked that this assumption does not imply that the union ought to be blamed for the rise in unemployment experienced, for example, in Holland. If the union represents employees well, then employees should in general be satisfied with the choice and accept the consequences, of

which unemployment is (the unpleasant) one. Next it does not imply that the unions caused the increase in unemployment. There are the other factors which influence the trade-off between (un)employment and wages and thereby the choice the unions make. These trade-off-influencing factors included the technology describing the production side of the economy, external influences such as real world-interest-rates and foreign income and government behaviour. By changing benefit levels, tax rates, investment subsidies, public-sector-employment and public expenditure, the government changes the labour-demand schedule. By changing the level of benefits and public-sector employment the government can change elements in the union's utility function in a direct way as well. For example reduced benefits will increase the emphasis which unions put on employment and induce them to reduce their wage claims which indeed will improve the employment situation. Another factor influencing unemployment is the solution concept of the model. For example a breakdown in the social contract between employers and trade union, to stick to the time-inconsistent solution and the other institutional features imbedded in the model (i.e. the unions have no direct say in the employment or investment decisions by the firms) may cause extra unemployment if the firms change their assessment of the credibility of unions and thereby make the time-consistent solution more appropriate.

In explaining the rise in unemployment in the Netherlands we will in particular stress the role the government played by enlarging the wedge between producers' and consumers' wage rates and by increasing the level of real benefits, and the breakdown in the social contract between employers and the trade union(s) at a time when the government had lost most of her direct institutional impact on the wage-setting process.

The chapter is organised as follows. The model is presented in sections 2-6. Section 2 deals with the behaviour of the monopolistically competitive firms notably their investment behaviour and demand for labour. In section 3 the macroeconomic aspects of aggregate demand are explained and the results of the interaction with the behaviour of firms is investigated. In section 4, unions enter the analysis, and the time-inconsistency of their behaviour is briefly discussed. Section 5 deals with credible wage formation. Confusion between real and nominal magnitudes is briefly discussed in section 6. The formal analysis of sections 2-6 is used in section 7 to explain the major empirical trends in the Netherlands. Section 8 concludes the chapter.

2 MONOPOLISTIC COMPETITION AND INVESTMENT BEHAVIOUR

Consider N firms involved in monopolistic competition. To a certain extent each firm can carve out a part of the market as products are not homogeneous. The standard analysis (McDonald and Solow, 1981) is extended, since each firm also faces an investment problem with internal adjustment costs (Gould, 1968). The demand curve for the products of firm n is given by:

$$y_n = D(y, P_n/P) = (y/N)(P_n/P)^{-\varepsilon(y)}, \quad \varepsilon_y \geq 0 \quad (8.1)$$

where y denotes aggregate demand in the economy, P_n denotes the price charged by firm n and P denotes the average price level. The technology of firm n is described by a concave production function, $y_n = f(k_n, l_n)$ where k_n denotes the capital stock of firm n and l_n denotes employment in firm n , with constant returns to scale and the usual neoclassical properties. Adjustment of the capital stock is costly. The larger the adjustment the higher the costs incurred. This can be formalised by including a convex internal adjustment cost function $\phi(i_n)$ in the profit function of firm n , where $\phi(0) = 0$, $\phi'' > 0$ and i_n denotes gross investment of firm n . Firms have some monopoly power in the product market but not in the labour market and face a given wage. Each firm maximises the discounted value of its profit stream:

$$\text{Max}_{P_n, l_n, i_n} \int_0^{\infty} e^{-rt} \pi_n dt, \quad \pi_n = P_n y_n - W l_n - q[i_n + \phi(i_n)] \quad (8.2)$$

subject to the capital accumulation equation:

$$\dot{k}_n = i_n - \delta k_n, \quad k_n(0) = k_n^0 \quad (8.3)$$

where r , δ , π_n , W and q denote the rate of interest, the depreciation rate, profits of firm n , the nominal wage paid by the firm and the price of investment goods, respectively. If the Hamiltonian of firm n is defined as

$$H_n \equiv P_n f(k_n, l_n) - W l_n - q[i_n + \phi(i_n)] - \chi_n[f(k_n, l_n) - D(y, P_n/P)] + \lambda'_n(i_n - \delta k_n) \quad (8.4)$$

where χ_n is a Lagrange multiplier and λ'_n is the nominal shadow price of capital for firm n , then the optimality conditions are $\partial H_n / \partial P_n = \partial H_n / \partial l_n = \partial H_n / \partial i_n = 0$ and $r\lambda'_n - \dot{\lambda}'_n = \partial H_n / \partial k_n$. They yield in symmetric equilibrium

$$P_n = P, \quad l = Nl_n, \quad k = Nk_n, \quad \lambda'_n = \lambda', \quad \chi_n = P/\varepsilon; \\ f_l(k, l) = W^P / [1 - \varepsilon^{-1}(y)] \quad (8.5)$$

where $W^P = W/P$ is the producers' real wage, $\phi'(i_n) = (\lambda'_n - q)/q$ or

$$i = I \left[\frac{\lambda - (1 - \sigma)}{1 - \sigma} \right], \quad I(0) = 0, \quad I' = N/\phi'' \quad (8.6)$$

where $q \equiv P(1 - \sigma)$, σ is the investment subsidy rate and $\lambda \equiv \lambda'/P$ is the real shadow price of capital, and

$$f_k(k, l)[1 - \varepsilon^{-1}(y)] = (r + \delta - \dot{P}/P - \dot{\lambda}'/\lambda)\lambda \quad (8.7)$$

Equation (8.5) says that the marginal revenue product of labour equals the real wage, so that the demand for labour can be written as

$$l = kh(W^P, y), \quad h_{W^P} < 0, \quad h_y \geq 0 \quad (8.8)$$

The advantage of a framework based on monopolistic competition is that the demand for labour not only decreases with the real producers' wage ($h_{W^P} < 0$) but also increases with the aggregate demand for goods ($h_y \geq 0$), since it is assumed that the elasticity of demand for each firm is an increasing function of aggregate demand ($\varepsilon'(y) \geq 0$). Nickell (1985) shows that the framework encompasses two interesting alternatives. Normal cost pricing assumes that the price mark-up;

$$P/W = [1 - \varepsilon^{-1}(y)]^{-1} / f_l(1, \tilde{f}(y, k)) \quad (8.9)$$

where $y/k = f(l, l/k)$ yields $l/k = \tilde{f}(y/k)$, is independent of demand, so that $\varepsilon'(y) > 0$ and therefore $h_y > 0$ must hold. Perfect competition leads to price equals marginal cost, so that $\varepsilon(y) = \infty$ and therefore $h_y = 0$. Equation (8.6) says that, when the marginal value of capital exceeds the real cost of investment goods, investment takes place. Equation (8.7) says that the marginal revenue product of capital has to match the user cost of capital, where the latter consists of the rental

charge plus the depreciation charge minus the capital gains term. Note that the firm will not, due to the presence of internal adjustment costs, adjust its capital stock instantaneously. The fact that adjustment costs increase with the absolute size of the rate of investment or disinvestment limits the size of the firm.

The behaviour of the firm can be described by the labour-demand curve, (8.8), the capital accumulation equation:

$$\dot{k} = I \left[\frac{\lambda - (1 - \sigma)}{1 - \sigma} \right] - \delta k, \quad k(0) = k^0, \quad (8.10)$$

and the shadow price equation:

$$\dot{\lambda} = (r^* + \delta)\lambda - g(W^P, y), \quad \lim_{t \rightarrow \infty} e^{-r^*t} \lambda(t) k(t) = 0 \quad (8.11)$$

where $r^* = r - \dot{P}/P$ is the real rate of interest given by the world real rate of interest and $g(W^P, y) \equiv f_k(l, h(W^P, y))(1 - \varepsilon^{-1}(y))$, $g_{W^P} < 0$, $g_y \geq 0$ gives the marginal revenue product of capital.

The steady-state investment rate is just sufficient to provide for depreciation, $i(\infty) = \delta k(\infty)$, and this raises the shadow price of capital above the price of investment goods, $\lambda(\infty) = 1 - \sigma + \phi'(\delta k(\infty))$. Upon substitution in (8.11), one obtains the steady-state levels of the capital stock:

$$k(\infty) = K^\infty(\bar{W}^P, \bar{y}, \bar{r}^*, \bar{\sigma}), \quad (8.12)$$

and of output

$$y(\infty) = K^\infty(W^P, y, r^*, \sigma) f(1, h(W^P, y)) \equiv Y^\infty(\bar{W}^P, \bar{y}, \bar{r}^*, \bar{\sigma}) \quad (8.13)$$

Hence, an increase in the real wage which firms have to pay or the real interest rate and a reduction in investment subsidies or aggregate demand leads to higher levels of capital, employment and output. Capital formation clearly accentuates the adverse consequences of higher real wage rates on employment. The determinant of (8.10)–(8.11) is $-\delta(r^* + \delta) < 0$, so the steady-state is a saddlepoint. Hence, capital is a backward-looking variable and investment (or λ) is a forward-looking variable. It follows that investment today depends on expectations of the producers' real wage, investment subsidies and aggregate demand tomorrow.

3 THE DEMAND-SIDE OF A SMALL OPEN ECONOMY

Section 2 described the supply side of the economy. This section describes the demand side. The economy is a small open economy with highly integrated capital markets and perfect substitution between home and foreign bonds, so that the home real interest rate is pegged to the world real interest rate (as it is assumed that the expected depreciation of the real exchange rate is zero). The rest of the economy is described by the following equations:

$$\begin{aligned}
 y &= c(\dot{y}^d, \bar{r}^*, \dot{a}_p) + I\left(\frac{\lambda - (1 - \sigma)}{1 - \sigma}\right) + \phi(i) + g \\
 &\quad + x\left(\dot{y}^*, \frac{p^* \bar{e}}{P}\right) - m\left(\dot{y}, \frac{p^* \bar{e}}{P}\right) \\
 &= y\left(\dot{\lambda}, \dot{a}_p, \bar{t}_1, \bar{t}_2, \bar{t}_3, \bar{t}_4, \dot{\sigma}, \dot{g}, \dot{l}_g, \dot{b}^c, \dot{n}, \bar{r}^*, \dot{y}^*, \frac{p^* \bar{e}}{P}, \dot{W}^p\right) \quad (8.14)
 \end{aligned}$$

$$M/P^c = l(y\dot{P}/P^c, \bar{r}, \dot{a}_p) \quad (8.15)$$

$$P^c = P^\beta (p^* e)^{1-\beta} (1 + t_3) \quad (8.16)$$

$$y^d = b_c(n - l - l_g) \frac{P^c}{P} + W^p(l + l_g)(1 - t_1)(1 - t_2) + \pi \frac{(1 - t_4)}{P} + r^* a_p \quad (8.17)$$

$$\begin{aligned}
 \dot{a}_p &\approx r^* a_f + W^p(l + l_g)(1 - t_1)(1 - t_2) + (n - l - l_g) b^c \frac{P^c}{P} \\
 &\quad + (1 - t_4) \frac{\pi}{P} - (1 + t_3) c \quad (8.18)
 \end{aligned}$$

$$a_f \approx y - [i + \phi(i)] - c - g_c + r^* a_f \quad (8.19)$$

$$W^c P^c = W^p P(1 - t_1)(1 - t_2), \quad t = \frac{W^p}{W^c} \quad (8.20)$$

- c real consumption¹
- y^d real disposable income²
- a_p real private sector asset holdings ($a_p = a_g + a_f$)
- a_g real public sector debt
- a_f real Dutch asset holdings
- g real public sector expenditure (using p as deflator)
- x real exports

y^*	world real income
p^*	foreign price level
e	nominal exchange rate
$\frac{p^*e}{P}$	real exchange rate
m	real imports ³
M	nominal stock of high powered money
P^c	consumers price index (geometrically weighted)
b^c	the real level of unemployment benefits (p^c is the deflator)
n	supply of labour
l_g	public sector employment
t_1	rate of employers and employees social security contributions
t_2	wage tax rate
t_3	rate of indirect taxation
t_4	profit tax
W^c	real consumers wage ($W^c = W/P^c$)
t	wedge between real producers' and consumers' wages

Equation (3.1) is the *IS*-curve, which shows that aggregate demand increases when, disposable income, real wealth, public spending (on goods), investment subsidies, the marginal value of capital, labour supply, public-sector employment or world income increases and when the real exchange rate depreciates. Equation (8.15) is the *LM*-curve, which shows that the real demand for cash balances increases with real income and wealth and decreases with the nominal interest rate. In the absence of any confusion between real and nominal magnitudes the monetary part of the model is separable from the real part, inflation is entirely a monetary phenomenon and therefore follows from the *LM*-curve. Equation (8.16) is based on Cobb-Douglas preferences and shows that the consumers' price index is a geometrically weighted average of the price of home and imported goods, plus a percentage to allow for the rate of indirect taxation. Equation (8.17) defines real disposable income, which consists of benefit income for the unemployed, after tax income for the private and public sector employed, after tax profit income and real income from asset holdings (private sector labour demand and profits can be solved from (8.2) and (8.8)). Equations (8.18) and (8.19) define respectively the private sector asset holdings and the net Dutch asset holdings. The increase in private-sector asset holdings corresponds to the increase in holdings of foreign assets and public debt. They follow from the private- and public-sector budget constraints.

Finally equation (8.20) defines the 'wedge' between what a firm pays a worker and what a worker receives in his pocket. The logarithm of this wedge can be approximated by:

$$\ln t = \ln \frac{W^p}{W^c} \approx t_1 + t_2 + t_3 + (1 - \beta) \log \left(\frac{p^* e}{P} \right), \quad (8.21)$$

so that the wedge increases when the real exchange rate depreciates or when any of the three tax rates increases. Obviously a larger wedge will lead to more unemployment (see section 4).

Intersection of the aggregate demand schedule (8.14) and the aggregate supply schedule $y = kf(1, h(tW^c, y) \equiv kF(tW^c)$ ensures goods market equilibrium and yields the equilibrium real exchange rate,

$$\frac{p^* e}{P} = \varepsilon(\overset{+}{k}, \bar{\lambda}, \bar{a}_p, \overset{+/-}{t}_1, \overset{+/-}{t}_2, \overset{+/-}{t}_3, \overset{+/-}{t}_4, \bar{\sigma}, \bar{g}, \bar{l}_g, \bar{b}^c, \bar{n}, \bar{r}^*, \bar{y}^*, \bar{W}^c) \quad (8.22)$$

producers real wage,

$$\begin{aligned} W^p &= tW^c \\ &= W^p(\overset{+}{k}, \bar{\lambda}, \bar{a}_p, \overset{+}{t}_1, \overset{+}{t}_2, \overset{+}{t}_3, \overset{+}{t}_4, \bar{\sigma}, \bar{g}, \bar{l}_g, \bar{b}^c, \bar{n}, \bar{r}^*, \bar{y}^*, \bar{W}^c) \end{aligned} \quad (8.23)$$

level of activities,

$$y = \bar{y}(\overset{+}{k}, \bar{\lambda}, \bar{a}_p, \bar{t}_1, \bar{t}_2, \bar{t}_3, \bar{t}_4, \bar{\sigma}, \bar{g}, \bar{l}_g, \bar{b}^c, \bar{n}, \bar{r}^*, \bar{y}^*, \bar{W}^c) \quad (8.24)$$

and labour demand (by (8.8)),

$$l = L(\overset{+}{k}, \bar{\lambda}, \bar{a}_p, \bar{t}_1, \bar{t}_2, \bar{t}_3, \bar{t}_4, \bar{\sigma}, \bar{g}, \bar{l}_g, \bar{b}^c, \bar{n}, \bar{r}^*, \bar{y}^*, \bar{W}^c) \quad (8.25)$$

An increase in aggregate demand, caused by an increase in public spending, world activity, wealth, investment subsidies, benefits, labour supply, government employment or the marginal value of capital to the firm or caused by a fall in the rate of social security contribution, direct tax rate or the world real interest rate, and a reduction in aggregate supply, caused by a fall in the capital stock or an increase in any of the four tax rates or the real consumers' wage, leads to an incipient excess demand for goods, which is choked off by a real appreciation of the exchange rate. This leads to a fall in the wedge

between the producers' and the consumers' real wage, over and above any changes in the wedge that causes the initial incipient excess demand for goods. Hence, the employment-generating effects of an increase in capital or a reduction in the wedge are attenuated by the associated depreciation of the real exchange rate. Also in a small open economy, increases in aggregate demand, e.g. due to increases in public spending or world income, increase employment and output, since the associated appreciation reduces the 'wedge'.

4 TIME-INCONSISTENCY OF THE OPTIMAL WAGES OF A MONOPOLY UNION

The small open economy has one dominant trade-union movement, which looks after the interests of both employed and unemployed workers. It has monopoly power on the labour market, so that it can effectively set any consumers' real wage it wishes. In choosing its wage the union takes account of the investment and employment decisions of the 'fringe' of monopolistically competitive firms and of the aggregate demand side of the economy, so the trade union is completely rational. It maximises a quasi-concave utility function:

$$\text{Max}_{w^c} \int_0^{\infty} e^{-r^* t} U(W^c, l) dt \quad (8.26)$$

subject to the reduced-form relationships (8.8), (8.10), (8.11), (8.18) and (8.23). For example, the union may attempt to maximise the total wage bill (e.g. Dunlop, 1944), total rent, that is surplus income over the wage bill under perfect competition in the labour market (e.g. de Menil, 1971) or a more general Stone-Geary utility function that allows for subsistence levels of wages and employment and the importance of supernumerary wages and employment (e.g. Pencavel, 1984). Alternatively, the private-sector trade-union maximises the expected utility of a member of the reference group of the union (e.g. McDonald and Solow, 1981; Oswald, 1985) of the form:

$$U(W^c, l) = \frac{l}{n - l_g} u(W^c) + \frac{(n - l - l_g)}{n - l_g} u(b^c), \quad u' > 0, \quad u'' \leq 0 \quad (8.27)$$

where n denotes labour supply, l private sector employment, l_g govern-

ment sector employment and b^c denotes the level of real unemployment benefits. $l/(n-l_g)$ is taken as the probability of a member of the reference group of being employed and $(n-l-l_g)/(n-l_g)$ as the probability of being unemployed. It is assumed that the trade unions reference-group includes all private-sector employees (l) and all unemployed ($n-l-l_g$). The union effectively acts as a Stackelberg leader and the rest of the economy as followers.

It will be assumed, for simplicity, that the elasticity of demand for each firm is constant ($\varepsilon_y = 0$) and that wealth effects in consumption are, due to capital market imperfections, fairly small ($c_3 \cong 0$). The Hamiltonian for the monopoly union can then be defined as:

$$\begin{aligned} H^u = & \frac{k}{n-l_g} h(W^p(\cdot)) [u(W^c) - u(b^c)] \\ & + \mu \left[I \left(\frac{\lambda - (1-\sigma)}{1-\sigma} \right) - \delta k \right] + \eta [(r^* + \delta)\lambda - g(W^p(\cdot))] \\ & + \text{constant} \end{aligned} \quad (8.28)$$

where μ and η are the union's shadow-price for capital and the firm's shadow-price of capital. Hence, on the assumption of an interior solution, the following are necessary conditions for optimality: $\partial^2 H^u / \partial^2 W^c < 0$, $\partial H^u / \partial W^c = 0$, or

$$\begin{aligned} & \frac{u(W^c) - u(b^c)}{u'(W^c)} \\ & = \frac{h(tW^c) - [\eta(n-l_g)g'(tW^c)/ku'(tW^c)]}{h'(tW^c)W_{15}^p(k, \lambda, a_p, t_1, t_2, t_3, t_4, \sigma, g, l_g, b^c, n, r^*, y^*, W^c)} \\ & > 0, \end{aligned} \quad (8.29)$$

$$\begin{aligned} \dot{\mu} &= r^* \mu - \partial H^u / \partial k \\ &= (r^* + \delta) \mu - \frac{[u(W^c) - u(b^c)]}{[n-l_g]} [h(tW^c) + kh'W_1^p] + \eta g'W_1^p, \\ \lim_{t \rightarrow \infty} e^{-r^*t} \mu(t)k(t) &= 0 \end{aligned} \quad (8.30)$$

and

$$\eta = r^* \eta - \partial H^u / \partial \lambda = -\delta \eta - \mu I' \left(\frac{\lambda - (1-\sigma)}{1-\sigma} \right), \quad \eta(0) = 0. \quad (8.31)$$

The marginal value to the union of the firms' shadow-price of capital must be equal to zero at the beginning of the planning period, because the firms' investment rate and shadow-price are free to jump at that point of time and therefore become effectively an additional policy instrument for the monopoly union.

Definition 4.1 The optimal wage strategy is time inconsistent (Kydland and Prescott, 1977) if there is an incentive for the union to reoptimise its wage strategy at some later date, that is if $\exists s, t$ such that $W^c(t, s) \neq W^c(t, 0)$, $s > 0$ and $t \geq s$, where $W^c(t, s)$ is the optimal consumption wage at time t when the planning period (re)starts at time s . \square

Proposition 4.1 The optimal wage strategy is time-inconsistent.

Proof: There is no time inconsistency if $\eta(t) = 0, \forall t \geq 0$. Assume therefore that this is the case and see whether this leads to a contradiction. Equation (8.31) shows that $\mu(t) = 0, \forall t \geq 0$ upon which equation (8.30) shows that either $W^c(t) = b^c, \forall t \geq 0$, or $h + kh'W_1^p = 0, \forall t \geq 0$. The former case implies, using equation (4.4), that $I(t) = 0, \forall t \geq 0$. This is inconsistent with the Inada conditions as $f_l \rightarrow \infty$ and not to b^c as $I/k \rightarrow 0$. The latter case implies $u(W^c) - u(b^c) = -u'(W^c)kW_1^p/W_{15}^p < 0$ or $W^c(t) < b, \forall t \geq 0$, which can not hold either as, workers would then prefer to be on the dole rather than be employed. Hence, $\eta(t) = 0, \forall t \geq 0$ can not hold along the equilibrium path and therefore the optimal wage strategy must be time-inconsistent.

This time inconsistency is a familiar feature of open-loop Stackelberg equilibrium solutions to differential games. It implies that the optimal wage strategies must be backed up by binding contracts, otherwise the union will renege. There is an incentive for the union to renege, because by announcing the intention of demanding low wages in the future along the lines of the time-inconsistent solution, it can persuade the firms to invest in a relatively large capital stock. Once the machines are installed, the monopoly union has an incentive to cheat and to claim higher wages than promised in order to extract the rent of a

quasi-fixed factor. Obviously, such cheating can be prevented by binding contracts. Grout (1984) and Bean (1983) find a similar time inconsistency in a two-period model with cooperative wage-employment contracts.

Equation (8.29) can be solved for W^c and for W^p ,

$$W^p = \bar{W}^p(\bar{\eta}/k, \bar{\lambda}, \bar{a}_p, \bar{t}_1, \bar{t}_2, \bar{t}_3, \bar{t}_4, \bar{\sigma}, \bar{g}, \bar{l}_g, \bar{b}_c, \bar{n}, \bar{r}^*, \bar{y}^*) \quad (8.32)$$

so that the wage firms have to pay increases when the level of unemployment benefits and public-sector employment increases or labour supply decreases, and furthermore when any of the four tax-rates increases or when there is a real appreciation (caused by an increase in λ , σ , g , a , or y^* or by a reduction in k or r^*). An increase in benefits reduces the gap between an employed and an unemployed person's utility and therefore reduces the marginal cost to the union from raising the wage. In other words, the union places at the margin, less value on jobs than on income and consequently demands a higher wage.

A reduction in labour supply or an increase in public-sector employment works in the same way as an increase in benefits. They reduce the utility attached to the gap between an employed and unemployed person's utility and therefore reduce the marginal benefits for the union from raising the wage. The supply effects of these variables dominate the opposite demand effects.

The marginal value to the union of the firms' investment rate, η , is typically negative, since the union and firms have conflicting objectives. For example in steady state $\mu(\infty) > 0$ so $\eta_1(\infty) < 0$ follows from (8.31). Hence, $-\eta$ can be interpreted as a marginal cost to the union. An increase in the marginal cost to the union of the firms' shadow-price increases the marginal cost to the union from raising the wage, because it worsens the adverse effects of a higher wage on the marginal productivity of capital. The monopoly union consequently values jobs, at the margin, more than income and lowers the optimal wage.

5 CREDIBLE WAGE FORMATION

The previous section showed that non-cooperative outcomes are time-inconsistent, so that binding contracts are required. However, in many countries such contracts are not available. In principle, it is possible that reputational forces may, when the discount rate is small enough

and the game between the monopoly union and the rest of the economy is repeated indefinitely, ensure that the monopoly union does not renege even though there is a short-run incentive to do so (e.g. Barro and Gordon, 1983; Driffill, 1985; van der Ploeg, 1987; Horn and Persson, 1985). It is one of the conjectures of this paper (see Section 7) that, due to increased conflict between the trade union movement and firms in the early 1970s the trust and reputational forces have broken down. In such circumstances the optimal (but time-inconsistent) wage strategies of Section 4 are no longer credible, because the firms no longer believe that the union will not renege when it has an incentive to do so. The main purpose of this section is to argue that credible outcomes are Pareto-inferior to the optimal outcomes and are characterised by high wages and low levels of the capital stock, employment and output.

It can be shown that the consistent outcome or the feedback Stackelberg equilibrium solution for this particular problem can be obtained by replacing equation (8.31) by $\eta(t) = 0$, $t \geq 0$ (see van der Ploeg, 1987), which avoids a rather cumbersome solution based on dynamic programming. It follows that the optimal wage rate to be paid by firms is given by:

$$W^p = \tilde{W}^p(0, \bar{k}, \bar{\lambda}, \bar{a}_p, \bar{t}_1, \bar{t}_2, \bar{t}_3, \bar{t}_4, \bar{\sigma}, \bar{g}, \bar{l}_g, \bar{b}^c, \bar{n}^*, \bar{r}^*, \bar{y}) \quad (8.33)$$

so that, *ceteris paribus*, the wage is higher than in the pre-commitment outcome of Section 4 where $\eta > 0$. It follows that the marginal productivity of capital, the shadow-value of capital and the labour-capital ratio are lower in the credible, consistent outcome than in the pre-commitment outcomes. Hence, less capital is accumulated and unemployment is high (because of both the higher producers' wage and the lower capital stock) when there are no binding contracts or reputational forces have broken down. The reason is that, in the absence of binding contracts, the monopoly union is unable to convince the firms that it will stick to a strategy of low wages. Consequently, firms accumulate less capital and jobs are lost. The introduction of long-term wage contracts or reputational forces leads to a Pareto improvement, since the lower cost of labour makes the firm better off and the union's utility is improved as there are many more jobs created. This paradox of the disadvantageous power of a monopoly union clearly demonstrates the desirability of a political, sociological and legal framework that ensures that announced wage strategies are enforced.

Note from (8.33) that an increase in benefits or in the wedge, due to an increase in any of the four taxes or due to real depreciation, increases the producers' wage and therefore leads to less capital and to more unemployment.

6 CONFUSION BETWEEN REAL AND NOMINAL MAGNITUDES

So far, we have given a detailed account of the interactions between a monopoly trade union and a fringe of monopolistically competitive producers in a small open economy under various institutional arrangements. It was found that unemployment increases when the direct tax rate, indirect tax rate, employers' and employees' social security contributions, the level of benefits or labour supply increases. Aggregate demand management only had a supply-side effect on unemployment through the wedge between the consumers' and producers' real wage. That is, a contraction of aggregate demand through an increase in the world real interest rate or a reduction in public spending or world income, leads to a long-run depreciation of the real exchange rate, lower prices for home produced goods, and therefore a larger wedge and more unemployment.

To give a more conventional role for aggregate demand, it is necessary to introduce some confusion between real and nominal magnitudes. For example, there may be asymmetric information so that the firm knows the price level exactly and the union has to form expectations of it (cf. Friedman, 1968). In that case (8.32) becomes:

$$W^p = \frac{p^e}{p} \tilde{W}^p(\eta/k, \lambda, a_p, t_1, t_2, t_3, t_4, \sigma, g, l_g, b^c, n, r^*, y^*) \quad (8.34)$$

and similarly for (5.1). With the assumption of adaptive expectations,

$$\frac{d}{dt} \left(\frac{\dot{p}^e}{p^e} \right) = \xi \left[\left(\frac{\dot{p}}{p} \right) - \left(\frac{\dot{p}^e}{p^e} \right) \right], \quad \xi > 0 \quad (8.35)$$

and the use of the *LM*-curve (8.15), to give the rate of inflation (\dot{p}/p), the model is complete. Under perfect foresight $\xi \rightarrow \infty$, the model becomes as in Sections 2-5. For finite ξ , it is possible for an expression of aggregate demand to lead to a temporary increase in employment

over and above the increase in employment due to the associated contraction of the wedge.

7 SUPPLY, DEMAND AND INSTITUTIONAL FEATURES IN THE NETHERLANDS

In the previous sections the analytical framework in which the empirical trends will be discussed was set out. In this section we will present some of these trends and discuss the way they fit together.

The most concerning and significant trend in the past fifteen years in Holland, as in many countries, has been the rise in unemployment. The Dutch unemployment rate has changed relatively much. It remained below the EEC or OECD average until the early 1970s, equalled the increased average of the unemployment rate of these sets of countries in the mid-1970s and at the end of the 1970s it steeply rose above the rising trend of the EEC and OECD countries (see Figure 8.1). Even though the official unemployment figures have increased so much, they still underestimate the actual trends in unemployment because of the various measures arranged to reduce the *official* number of unemployed. In Holland these measures include increased compulsory enrolment in educational institutions and benefits for disabled workers which are granted partly on the basis of the employment perspectives of the participants.

Underlying the trend in unemployment are the trends in *employment* ($I + I_g$) and *labour supply* (n) (Figure 8.2). The rise in employment levelled off in the early 1970s whereas the labour force kept increasing. We have included in the figure N broad, a series for labour supply which includes the in-stream in the disabled benefits programme for employed since its major modification in 1969 and N potential, a series which is constructed by taking 70 per cent of the population in the age range 20-64. 70 per cent is roughly the Dutch participation ratio in the 1950s.

The number of employed is in fact a bad measure for *real employment*, total hours worked (see Figure 8.3), because hours worked per year per person and sick-leave have changed rather significantly over the years. Sick-leave and hours worked per year show a long-run upward trend, whereas the first moves pro- and the second counter-cyclically.

Another important trend is the one in investment (Figure 8.4). Comparing Figure 8.4 with Figure 8.3 illustrates why we have put so

much emphasis on explaining employment and investment in relation to each other. The levelling off of employment growth (I) coincides with the drop in gross (i) and net investment as a percentage of the production of firms (y). If (proper) data on the capital stock had been available for the Netherlands, the labour-capital ratio (I/k , see equation (8.8)) would have provided valuable insights.

Figure 8.1 Unemployment in The Netherlands, the EEC and OECD, 1966-83

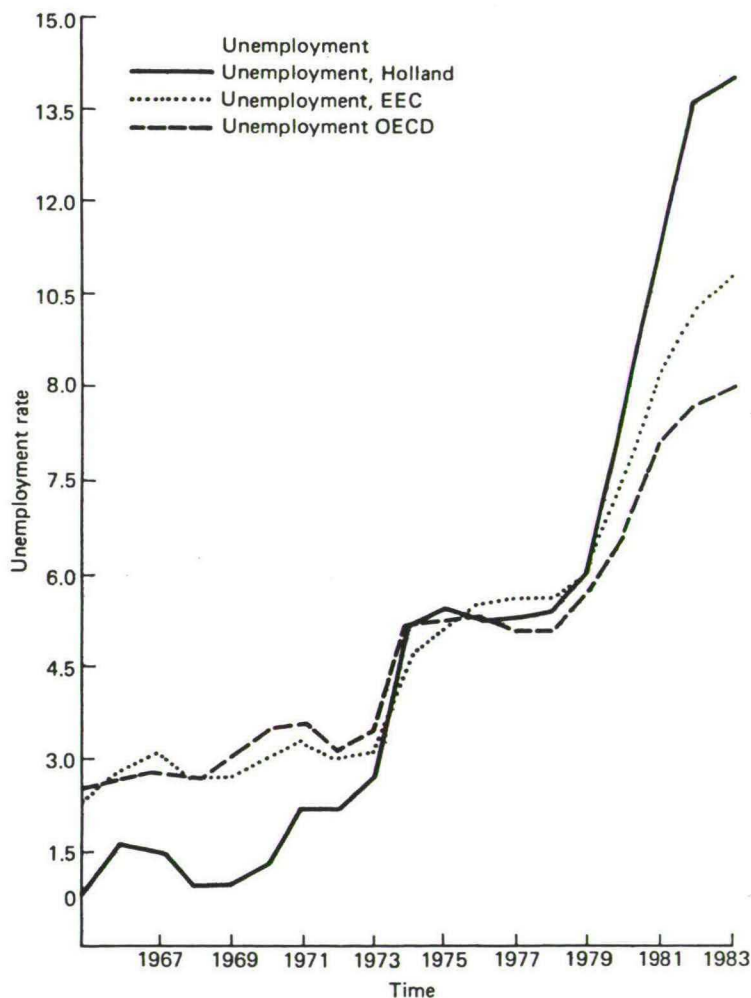


Figure 8.2 The composition of the potential labour force in the Netherlands, 1955-84

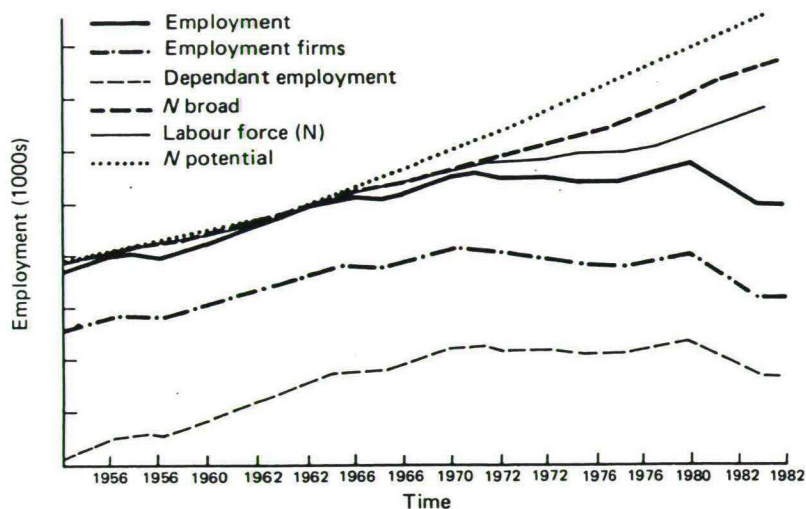


Figure 8.3 Employment in the Netherlands, 1955-84

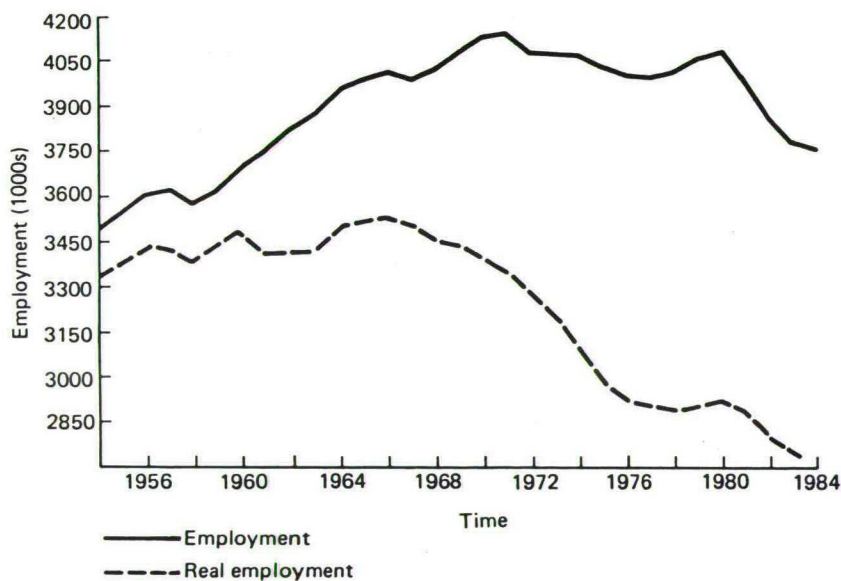
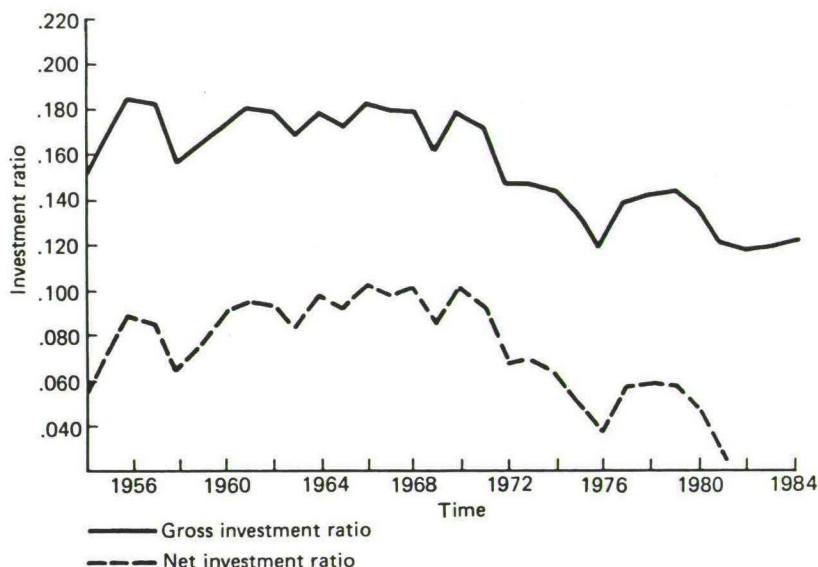


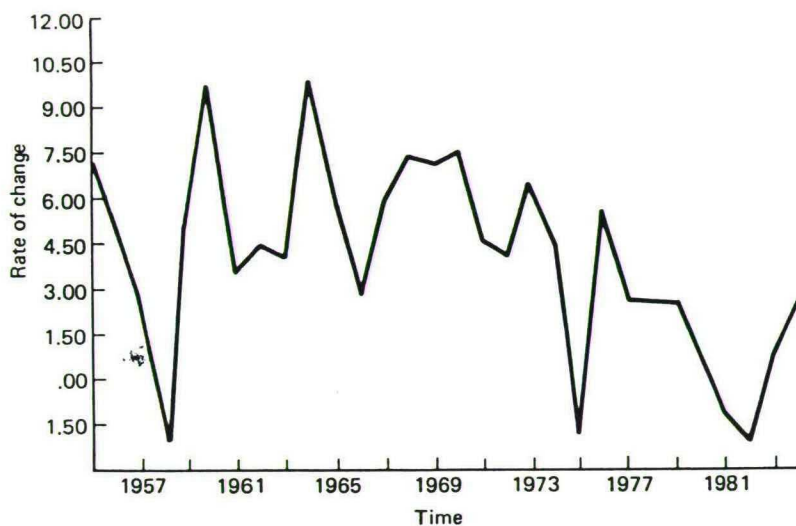
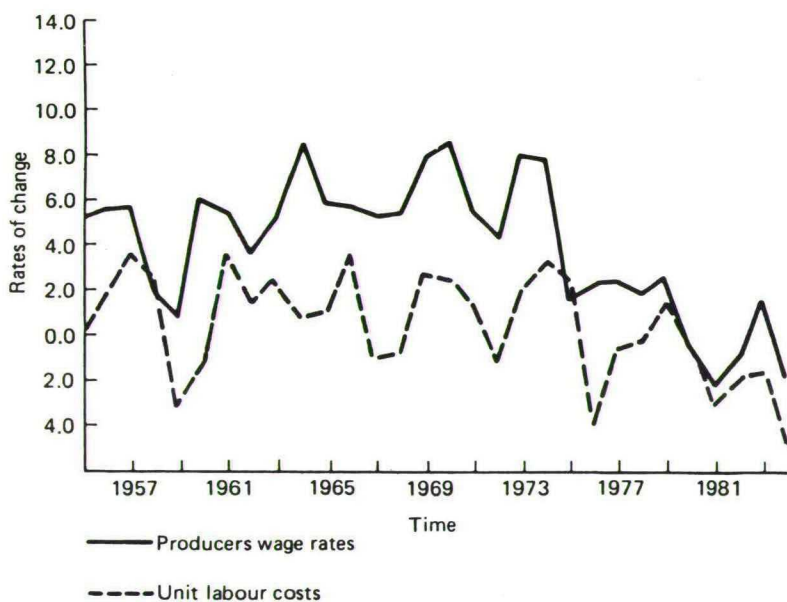
Figure 8.4 Investment in the Netherlands, 1955-84



The change in output (\dot{y}), labour costs (\dot{W}^p) and labour productivity ($\dot{y} - \dot{l} - \dot{W}^p$) are the subjects of Figures 8.5 and 8.6 respectively.

A number of factors, to some extent specifically Dutch, may be responsible for these trends in output, (un)employment, investment and labour costs. In sections 2-6 we have set up a framework to analyse these factors. Various external factors, foreign income y^* , real foreign interest rates r^* , labour supply n , and government factors, government demand for goods g , various tax and social security contribution rates (t_1, t_2, t_3, t_4), investment subsidies, public sector employment and the real level of benefits were distinguished, besides the private sector stock of wealth, a_p , and capital stock, k . It is rather unfortunate that there are no proper data on the marginal value of capital, λ , or on Tobin's 'Q', available. This co-state variable λ is closely correlated with investment and both are complex functions of present, past and future versions of the exogenous variables. This makes analysis without exact observations on λ rather hard. The same lack of data applies for investment subsidies (or negative taxes), σ .

Government demand for goods, g , and world trade or world activity, y^* , exert their influence mainly through the demand side.⁴ The short-run effect, for given values of a , k , and λ , of an increase in world

Figure 8.5 Output growth in the Netherlands, 1955-84*Figure 8.6* Growth in wage rates and unit labour costs in the Netherlands, 1955-84

trade or government demand is an increase in the price of home-produced goods and therefore an appreciation of the real exchange rate (p^*e/P). An increase in the real foreign interest rate, r^* , for we used the deflated German call money rate, has the opposite effect on the real exchange rate. World-trade growth is depicted in Figure 8.7, real foreign interest rate in Figure 8.8, government expenditure in Figure 8.9 and the real exchange rate in Figure 8.10. The appreciation of the real exchange rate in the 1970s is fairly well explained by the short-run effects of the changes in world trade, real foreign interest rates and government demand. The appreciation of the real exchange rate reduced the wedge between producers' and consumers' real wage rates and this by itself must have stimulated output and labour demand and reduced unemployment.

The development of the 'wedge' was however dominated by other factors – the tax rates and rates of social security contribution. During the past two decades, direct and indirect tax rates (t_2, t_3) and the employers' and employees' rates of social security contribution (t_1) have increased at a breathtaking pace (Figure 8.11), and have enlarged the wedge considerably (Figure 8.12). Though part of the increased burden of taxes and social security contributions is borne by the wage-earners, a rational union will not make the members of its reference group bear the complete burden. It will reduce the consumer

Figure 8.7 World trade growth, 1960–84

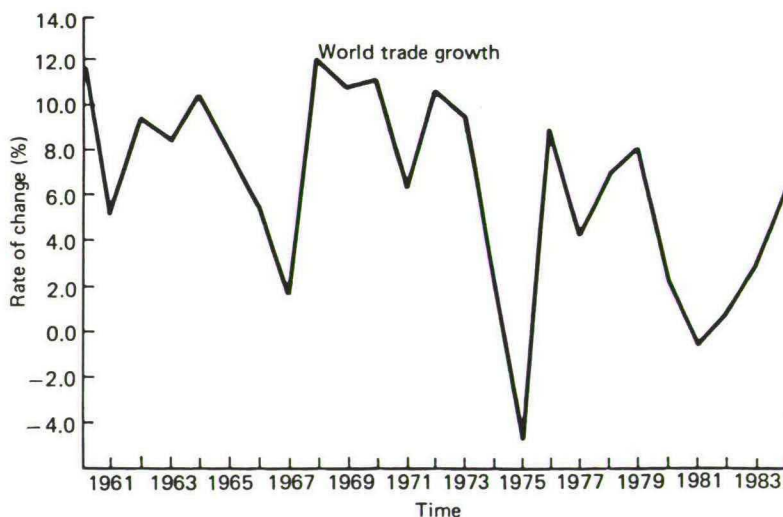


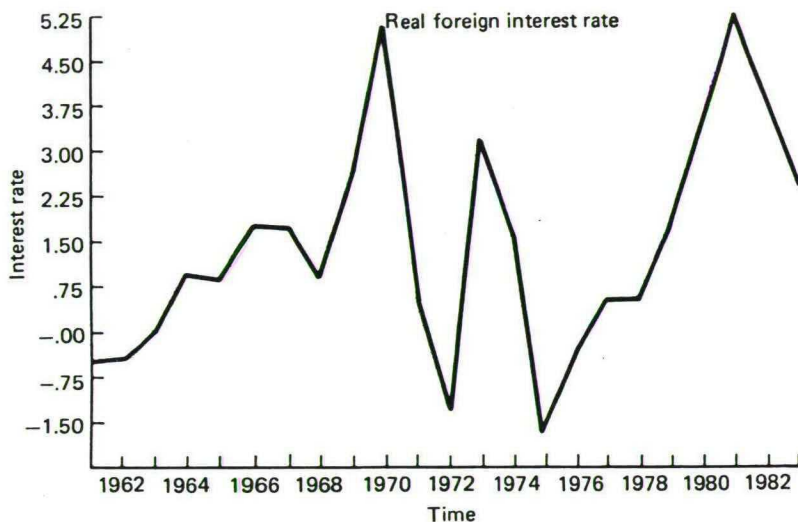
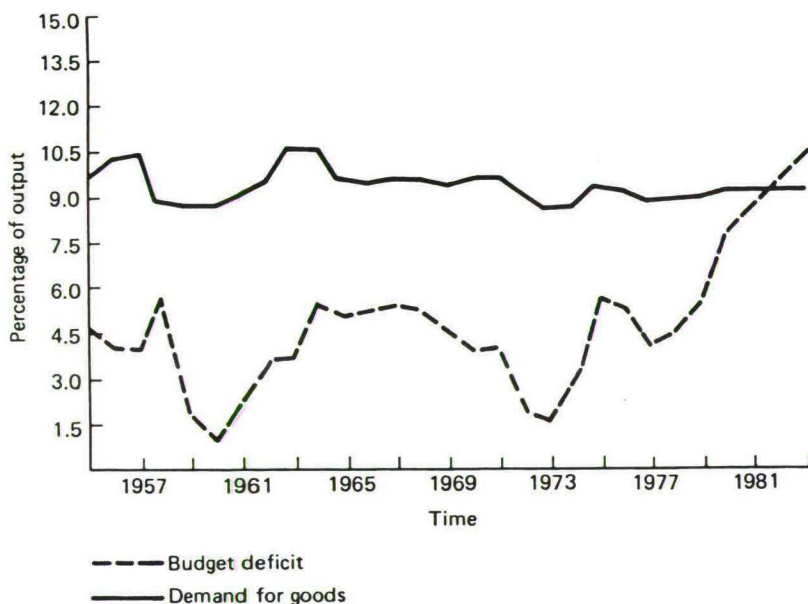
Figure 8.8 The real foreign interest rate, 1961-83**Figure 8.9** Government expenditure and budget deficit in the Netherlands, 1955-83

Figure 8.10 The real exchange rate for the Netherlands, 1959-84

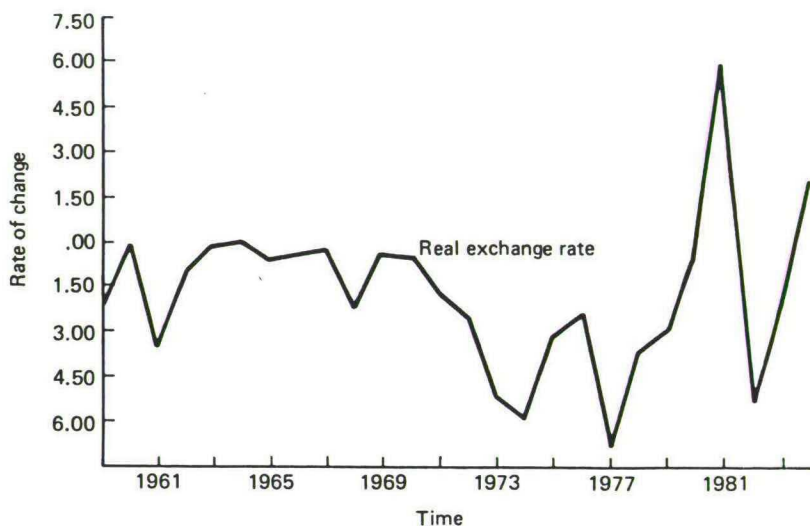


Figure 8.11 Taxes and social security in the Netherlands, 1955-84

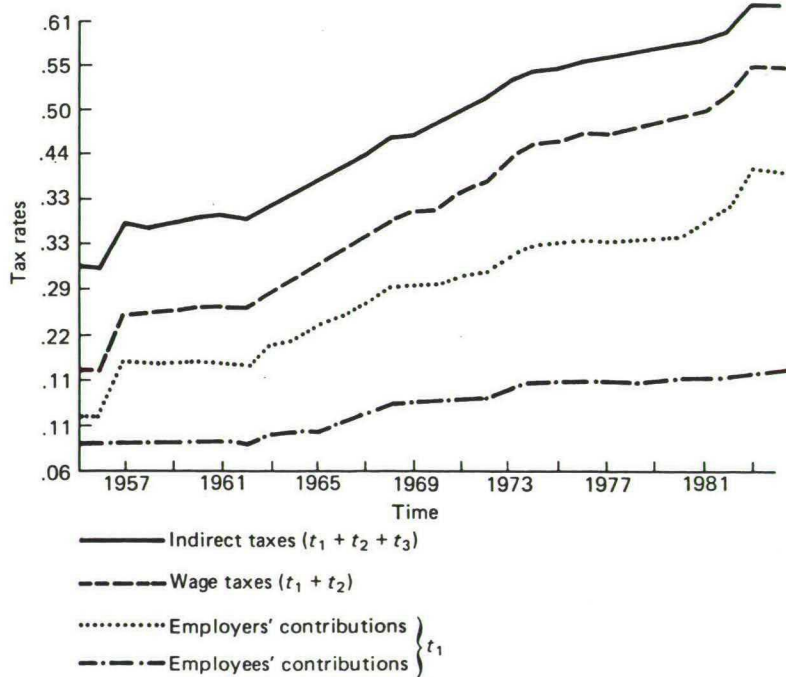
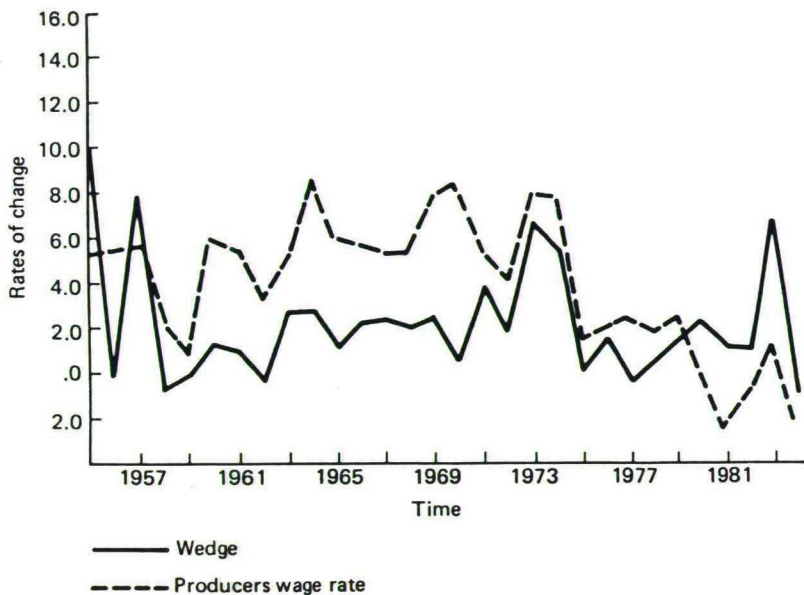


Figure 8.12 The wedge in the Netherlands, 1955-84

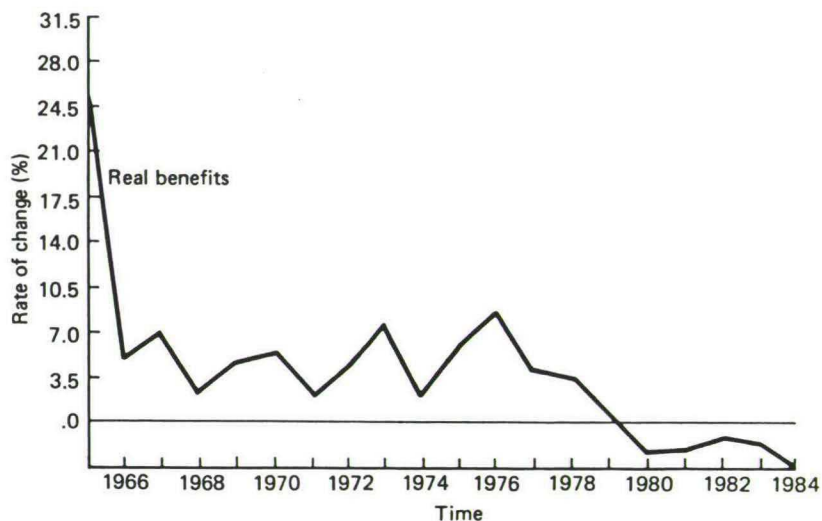


wage rates, but by a smaller percentage than the tax or social security contribution rate increase. This behaviour results in increased producer-wages, reduced levels of employment and increased unemployment.

Another major impact on the economy has come from the benefit-setting behaviour of the government. Benefits, b^c , have grown at an incredible pace up to 1979 (Figure 8.13). The effects on real wage costs (producer-wage-rates) of raising real benefit levels are rather large. In this way the government reduces the marginal costs to the union of raising the consumers' wage. The effects on wages were especially large since around 1970. Benefits were linked to the consumers' wage rates at that time, effectively reducing the marginal costs to the union of raising the consumers' wage rate even further.

The gradual enlargement of the number of civil servants, l_g and the rapidly increasing number of beneficiaries of disabled 'pensions' (see Figure 8.2) will have had the same effect as increasing benefits had. By removing unemployed from the labour force, in particular the private-sector labour force, the government prevented the rapidly increasing labour force, n , from exerting a moderating influence on

Figure 8.13 Changes in real benefits in the Netherlands, 1965-84



the consumers' wage rate by increasing the marginal costs to the trade union of raising the wage rate.

Another cause for the large drop in the employment growth rate coinciding with the drop in investment can be sought in the institutional relations between trade union(s) and firms. The post-war history of Holland was one of close cooperation between trade union(s), government and firms to rebuild the war-damaged Dutch economy. The ensuing cooperation led to wages below the free market level and the observation of 'black wages', illegal bonuses paid on top of the officially agreed wages (Windmuller, de Galan and van Zweeden, 1983). In the 1960s the wage-guide policy of the government was relaxed, though the government retained some instruments to influence the wage-setting process. The dispute about the new wage-guide act, 'de Loonwet 1968', indicates that even the reduced role of the government in wage-setting was no longer generally accepted.

One might say that the social contract between trade unions and firms broke down at the end of the 1960s and the beginning of the 1970s. The year 1971 saw a wild strike in the harbour, warning the trade-union leadership that a more aggressive attitude was wanted. In the labour party's political programme 'turnpoint '72', various proposals were launched by which the trade unions would be given, among other things, a say in the investment decision of firms.

In the terminology of our model we can describe these developments as follows; the social contract between trade unions and firms determines the rules of the game: the trade union sets the wage, but the firms take the investment decisions; the government guarantees a more moderate and socially superior outcome of the wage-setting process, say by making the time-inconsistent solution of the model feasible (of course there are other ways to formalise this idea as well). The breakdown of the social contract can be seen as a change to the time-consistent solution of the model. Without a (government) guarantee that the trade union(s) stick to their words (the announcements of future consumer-wage-rates) and given the increased antagonism and distrust between the trade union(s) on the one hand and employers on the other hand, the socially inferior time-consistent solution will be appropriate, implying decreased levels of investment and employment and an increased unemployment rate.

8 CONCLUDING REMARKS

In this chapter we have modelled a small open economy with strong trade unions. The supply side was well-developed, investment was explicitly treated as well as trade union behaviour, and a demand side was specified.

The results of our formal analysis were used to trace the consequences of demand side, supply side and institutional changes on the Dutch economy. The most striking facts are the historical increase in the wedge between the producers' and the consumers' real wage, the rise in real benefit levels and possibly, a regime switch from 'rules' to 'discretion'. They have all contributed significantly to the large drop in investment and the large rise of unemployment in the Netherlands.

Appendix: Summary of Model

Supply-model

$$l = kh(t\bar{W}^c, \hat{y}); \quad y = kf(l, h(tW^c, y)) \quad (\text{A.1})$$

$$\dot{k} = I\left(\frac{\lambda - (1 - \sigma)}{1 - \sigma}\right) - \delta k, \quad k(0) = k_0 \quad (\text{A.2})$$

$$\dot{\lambda} = (r^* + \delta)\lambda - g(t\bar{W}^c, \hat{y}), \quad \lim_{t \rightarrow \infty} e^{-r^*t} [\lambda(t)k(t)] = 0 \quad (\text{A.3})$$

Demand-side

$$r^* = r - \dot{P}/P = \text{exogenous} \quad (\text{A.4})$$

$$y = Y \left(\bar{\lambda}, \bar{a}_p, \bar{t}_1, \bar{t}_2, \bar{t}_3, \bar{t}_4, \bar{\sigma}, \bar{g}, \bar{l}_g, \bar{b}^c, \bar{r}^*, \bar{y}^*, \frac{\bar{p}^* e}{P}, W^p \right) \quad (\text{A.5})$$

$$\frac{(p^* e/P)^{-(1-\beta)}}{(1+t_3)} \frac{M}{P} = M/P^c = l(y \cdot \dot{P}/P_c, -r^* + \dot{P}/P, \bar{a}_p) \quad (\text{A.6})$$

$$\dot{a}_f = r^* a_f + f(k, l) - \phi(i) - c - g - i, \quad a(0) = a_0 \quad (\text{A.7})$$

Union behaviour

$$\text{Max}_{W^c} \int_0^\infty \left[\frac{l}{n-l_g} u(W^c) + \frac{(n-l-l_g)}{(n-l_g)} u(b) \right] e^{-r^* t} dt \quad (\text{A.8})$$

s.t. (1)–(7)

Notes

- 1 Note that $c = (c^d P + c^* p^* e)/P$ where c^d is consumption of domestic goods and c^* is consumption of foreign goods.
- 2 After inflation adjustment of the asset holdings.
- 3 From (8.16) $c^* p^* e = (1-\beta)(c^d P + c^* p^* e)$, so $m = c^* = (1-\beta)c(p^* e/P)$.
- 4 World-trade differs from world activity in the sense that it signals improved international division of labour as well as world activity. An improved international division of labour shifts the production frontier. Holland may well have benefited to a large extent from such tendencies in the 1960s.

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